ABSTRACT OF THE DISCLOSURE

High pressure synthesis of various crystals such as diamond, cBN and the like can be carried out using reaction assemblies suitable for use in methods such as temperature gradient methods. The reaction assembly can be oriented substantially perpendicular to gravity during application of high pressure. Orienting the reaction assembly in this manner can avoid detrimental effects of gravity on the molten catalyst, e.g., convection, hence increasing available volumes for growing high quality crystals. Multiple reaction assemblies can be oriented in series or parallel, each reaction assembly having one or more growth cells suitable for growth of high quality crystals. Additionally, various high pressure apparatuses can be used. A split die design allows for particularly effective results and control of temperature and growth conditions for individual crystals.